OVERVIEW OF NIDGE: A FRAMEWORK TO DESIGN NARRATIVELY INTERACTIVE AND DRAMATIC VIDEOGAME

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Interactivity makes a videogame (game) as a unique and exciting entertainment medium. We believe that the current state of games has only scratched the surface of the potential of interactivity. In particular, games today have not successfully let players interact highly with the game narratives. Most games, like movies, have their narratives pre-determined; hence, are not narratively interactive. Moreover, unlike movies, most game narratives are not very dramatic.

This paper focuses on the narrative aspect of the entertainment value of game. By analyzing the movie and current game narratives, we design a framework called NIDGE that allows a game to have interactive and dramatic narrative at the theme-level.

Key words: narrative interactivity, dramatic narrative, plot unit, dream production mechanisms.

1. INTRODUCTION

Theme and Plot

Minimally a narrative has at least a theme and a plot. When we tell someone a narrative, we usually describe its plots rather than its themes. The reason for communicating a narrative at the plot-level is because a narrative is always about people and their world/universe. The audience must be familiar with the universe of the narrative in order to make sense of the narrative.

For example, in a narrative with a retaliation theme, the "after-being-bullied-by-his-schoolmates-John-becomes-mad-and-shoots-them-all" plot could be understood by 21st century North Americans because retaliation like this happened in their universe. However, the same plot may not make any sense when told to the ancient people of the Fiji Island, where guns did not exist and killing others might not be an option. On the other hand, a narrative with "Vijay-lies-to-his-friend-and-on-the way-back-home-he-is-struck-by-lightning" plot makes sense to the ancient people of the Fiji Island, but not for the 21st century North Americans. Interestingly, both plots share a common theme, which is retaliation.

The key idea is that even though a narrative must be communicated to the audience as its plots, there must be themes, which underlie (the foundation of) these plots. A theme can be instantiated into many different plots according to the universes of the respective narratives. And, we say that a plot is similar to another plot if they both share a common theme.

Objective and thesis

Our objective is to marry interactivity and drama in games. Specifically, we would like to extend the design of the traditional game to give the player a high degree of freedom to shape the game narrative (Narrative Interactivity) and to keep the game narrative highly dramatic (Dramatic Narrative) (see table 1).

	Movie	Traditional Game	Our Game
Dramatic Narrative	High	Low to High	High
Narrative Interactivity	---	Low	High

Table 1: Comparing the narrative aspect of movie, traditional game, and our game.

In this paper, we propose the design of NIDGE (Narratively Interactive and Dramatic Game Extension), which achieves the foundation that serves our objective. By foundation, we mean that NIDGE could produce the themes of a game narrative that satisfy our objective; however, NIDGE does not instantiate these themes into plots.

Dream and NIDGE

To achieve its purpose (the foundation), the design of NIDGE is inspired by dream production mechanisms. A dream is a form of narrative, where the dreamer can somewhat control the dream narrative (a form of narrative interactivity). Moreover, to the dreamer, the dream narrative may seem real and dramatic during the duration of the dream (e.g., nightmares), even though the dream may not make any sense after the dreamer wakes up[1]. The key idea is that our intended game is comparable to a dream; therefore, we choose existing dream production mechanisms as the model of NIDGE.

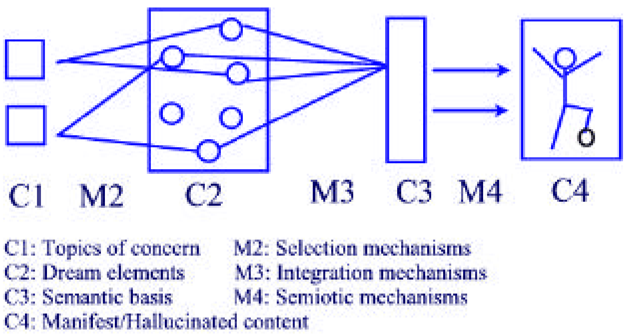


Figure 1: Dream production mechanisms [Montangero, 1991].

Figure 1 depicts a model of dream production mechanisms [Montangero, 1991]. There are four levels of content (C1 to C4), and four production mechanisms (M1 to M4). A dream starts with selecting (M1) some concerns—not shown in figure 1—from topics of concern (C1). Using the selection mechanism (M2), these concerns trigger some dream elements in a dreamer's episodic memory and general knowledge (C2). The triggered dream elements are juxtaposed and coordinated by an integration mechanism (M3). The result of the integration forms a semantic basis (C3), a set of significations, which pertain to the dreamer's knowledge; this set of significations exists independently of precise images, or words. Finally this semantic basis is subjected to semiotic mechanisms (M4) that create the manifestation of the semantic basis or hallucinated content (C4).

For example, say that an "I-must-not-lose-or-fail" concern has been selected. The selection mechanism (M2) uses this concern to trigger two dream elements: a soccer player (because the dreamer plays soccer, and a soccer game entails winning or losing), and a classroom (because that is where the dreamer once took a difficult exam, and of course, an exam entail passing or failing). Then, the integration mechanism (M3) juxtaposes these dream elements into a semantic basis: "A-student with-a-soccer-uniform". Finally, this semantic basis is manifested as "A-student-in-a-soccer-uniform-repetitively-kicking-a-desk-in-a-classroom".

Montangero also stresses that because a dream is a form of narrative, it is very rarely composed of one static situation. Therefore, there needs to be some processes to regulate the narrative structure of a dream.

From Montangero's dream production mechanisms we come up with the following general strategies in designing NIDGE:

- The player actions and the state of the game universe trigger some concerns.
- A concern may grow and form a theme. This theme triggers some existing narratives[2] with the same theme.
- NIDGE shapes the game narrative (during the game session) by switching from one existing narrative to another; such that the complete game narrative becomes a conglomeration of these existing narratives' fragments. This switching process must be transparent to the player; otherwise, the game narrative may be perceived as weird like a dream.

Notice the dream production mechanisms that NIDGE covers are only from M1 to M3, and the contents are from C1 to C3. In NIDGE, C3 would be the game narrative represented in theme-level. M4 and C4 are necessary to create the plot-level representation of the game narrative; however, they are beyond the scope of this paper.

Organization of the paper

The rest of the paper is organized as follows.

- Section 2: Three design issues which need to be addressed.
- Section 3: The architecture of NIDGE.
- Section 4: The expected qualities of our game narrative (powered by NIDGE) compared to the other narratives.
- Section 5: Discussion.

2. **DESIGN ISSUES**

Before we discuss the design of NIDGE, there are three design issues to be addressed to support the general strategies. These issues are:

[1] Using the relation of plot and theme, the reason for the different perception of a dream in the dream and waking states may be because of the differences in the universes activated. When one sleeps, she enters the dream universe while the real-life universe is suspended, and vice versa. This is as far as we want to analyze a dream.

[2] Existing narratives are traditional narratives (e.g., novel, movies, plays, etc.) that are stored in NIDGE's database. These existing narratives form the C2 of NIDGE.

1. How to represent narratives in NIDGE?
2. What kind of existing narratives should be loaded into NIDGE?
3. How to make the conglomeration of existing narratives appears as a normal narrative (avoiding the Frankenstein syndrome[3])?

Issue #1: Representing narratives in NIDGE

The first issue is to decide on a representation that is suitable for C1 to C3. We observe that the C1 to C3 of NIDGE contain data of the same type, which is narrative. However, the narratives of C1 to C3 have different levels of complexity. C1 contains concerns/themes, which are simple narratives (each can be represented by a theme). C2 contains existing narratives, which are complex narratives (each can be represented by a collection of themes). C3 contains a game narrative, which eventually becomes a complex narrative when the game session ends. To alleviate the production mechanisms from having to worry about converting from one narrative representation to another, all narratives in C1 to C3 must decide on one narrative representation.

Lehnert's narrative representation [Lehnert, 1982] represents a narrative at the theme-level. A narrative is represented by interconnections of plot units, Lehnert's term for themes. A plot unit is composed of simple emotional reactions (affect states); and simple causal relations (causal links), which are used to connect the affect states together.

There are three kinds of affect state.

- (+) happy emotion (e.g., you get a raise).
- (--) sad emotion (e.g., you get fired).
- (M) intention to do something (e.g., you decide to work).

There are four kinds of causal link[4].

- *m-link:* motivation (e.g., your new born son *motivates* (m-link) you to work harder).
- *a-link:* actualization (e.g., you *decide to eat*, then you *cook* (a-link) some food).
- *t-link:* termination (e.g., you *win* a lottery, then you *lose* (t-link with *win*) the winning money on the blackjack table).
- *e-link:* equivalence (e.g., You are *happy* to go to college, but you are *sad* (e-link with *happy*) to leave your family).

Moreover, a minimum of two affect states and a causal link are needed to form a Primitive Plot Unit (PPU). In total there are 15 valid affect-state and causal link combinations, therefore there are 15 PPUs (table 2). These PPUs act as the building blocks for more complex configurations.

	M M	M +	M --	+ M	-- M	+ -	- +	+ +	--
m-link	*			*	*				
a-link		*	*						
t-link	*					*	*	*	*
e-link	*					*	*	*	*

Table 2: 15 valid affect-state and causal link combinations (PPUs) (* means valid).

Any number of PPUs can be combined to form unlimited number of Complex Plot Units (CPUs). Fortunately, because a narrative is limited in length, it can be represented by a relatively small number of CPUs. For example, consider the *Hungry John* narrative below.

> "*John was hungry. He decided to cook. Unfortunately, he was not a good cook. He burned his food. John decided not to cook anymore. He went to buy a Big Mac. He ate the burger*".

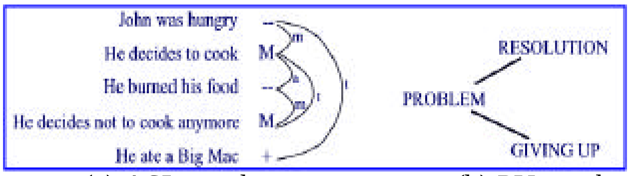
Lehnert's narrative representation can represent *Hungry John* in two levels of detail. The Affect-State-Link (ASL) graph representation shows every scene[5] that builds the narrative, where the Plot Unit (PU) graph representation shows the themes of the narrative. The PU graph is better in summarizing the narrative, while the ASL graph is better in providing the details of what happened to the character in the

[3] Our strategy, like dream, is to build the game narrative by joining fragments of the existing narratives. In dream, this strategy causes the "weirdness" of a dream (when the dream is perceived from the waking state). Frankenstein syndrome is a term we use to explain this "weirdness". As a metaphor of our game narrative, Frankenstein's body is composed of body parts from many people, and his body makes Frankenstein to be perceived as a weird man—a monster.

[4] Lehnert defines a d-link, which is a causal link to connect two affect states experienced by two different characters that is caused by a single event. However, for simplicity we exclude the d-link.

[5] The term scene is described in [Mateas, 2000] as a narrative progression that changes values—properties of an individual or relationship such as love, hope, trust, etc.

narrative. Both representations relieve the narrative from words, sentences, images, or sounds[6].



(a) ASL graph (b) PU graph

Figure 2: Affect-State-Link (ASL) and Plot Unit (PU) graphs of *Hungry John*

The plot units used in figure 2 (b) are defined in figure 3 (vocabulary). In figure 3, there are three PPUs[7] (PROBLEM, RESOLUTION, FAILURE) and one CPU (GIVING UP). The PPUs are fixed and defined in table 2 (the PPUs' names are defined in [Lehnert, 1982]), and the GIVING UP is could potentially be defined by the author (although in this case, we borrow the GIVING UP CPU defined in [Lehnert, 1982]).

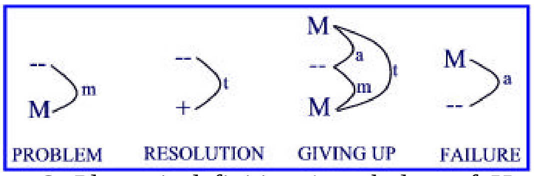


Figure 3: Plot unit definitions/vocabulary of *Hungry John*.

The key idea is that all narratives in NIDGE are represented in Lehnert's narrative representation.

Issue #2: Model of the existing and game narratives (complex narratives).

From issue #1, we know that an existing narrative (C2 and C3) can be represented by a collection of themes/plot units. But in what way do we arrange this collection of plot units? We decide to use the movie narrative as the model for these existing narratives. The reason is because movie narrative is easy to understand, well studied, and like games, it uses audio-visual medium.

The plot units of an existing narrative must be arranged to exhibit some characteristics of the movie narrative. Below are the characteristics/conventions of the movie narrative [Vale, 1972] that we consider as important.

- *Plot-centric:* focuses more on the actions of the people rather than their characters.
- *Pain, Intention, and goal:* Pain, represented as (--), may motivate a person to act. A significant pain triggers an intention, represented as (M). Once the intention is set, the person acts to reach the goal. The goal is to eliminate the pain or the intention.
- *Close-ended:* All significant pains and intentions must be closed[8]. Therefore, comments such as "Is John going to get the girl? Is Mary going to survive the accident?" should not occur after a movie narrative has ended.
- *One main intention:* To limit the scope and time of the narrative, a movie narrative is driven by a main intention (the backbone of the narrative), and the narrative is complete when the main intention is closed. Some movie narratives have two or three main intentions, but we would not consider such movie narratives.

Issue #3: Avoiding the Frankenstein syndrome.

Even though a dream seems to be logical when we dream it; most of the time, after we wake up, we perceive the dream to be illogical/weird. And because a dream represents a juxtaposition of many dream elements, we say that the dream narrative exhibits the Frankenstein syndrome when it is perceived as weird.

We believe that the reason for this Frankenstein syndrome is because the universe of the dream has different set of constraints than the universe of the awake. For example, a princess milking a cow is weird in the waking state because the waking universe has the princess-does-not-do-hard-labor constraint. On the other hand, in the dream universe, such a constraint may not exist.

A movie narrative is easy to understand because it follows certain constraints (conventions or formulas), which are products of decades of Hollywood's filmmaking experiments [Schatz, 1981]. These conventions become the language of the average moviegoer to interpret the movie narrative. Attempts to break the conventions may inhibit the average moviegoer to follow the movie narrative. For our purpose, the conventions that we interested in are the ones discussed in issue #2.

[6] The English description beside each affect state is only for explanation purposes, they do not exist in the actual representation.

[7] As a writing convention, Lehnert's plot unit names are typed in all upper case (e.g., RETALIATION).

[8] Each affect state has a close attribute which is a boolean attribute. The default is set to "no". The attribute is set to "yes" if the affect state is closed with a t-link or an e-link [Kurniawan, 2001]

Presentation Layer

Traditional Game Modules are modules that could be found in traditional game concepts [Rouse, 2001]. In NIDGE, these modules are the Game Logic and Universe.

Game Logic (GL) is in charge of building the overall game. GL's responsibilities:

1. Logic: GL captures the rules of the game.
2. Processing: GL applies data to the above rules to move the game from one game state to the next. There are two types of data: universe data (data that reflects the current state of the game) and narrative data (data that builds the game narrative).

Universe stores all universe data.

Drama Manager (DM) acts as the project manager in charge of building the game narrative. DM's responsibilities:

1. *Observe and Interpret*: DM monitors the Universe and interprets the changing state of the game into narrative data.
2. *Manage the game narrative*: GL wants the next narrative data. The modules in analysis layer (BPIM and APIM) need existing narrative data to decide on the next narrative data. DM makes sure every module gets what it needs at the right time and at the right amount.

Game Narrative Buffer (GNB) acts as a buffer and a blueprint. As a buffer, it is where the DM stores the narrative data. As a blueprint, it informs the DM about the structure of the game narrative, characteristics of the game narrative (see key issue #2), and the interactivity mechanism to use (see Analysis Layer). GNB is the C3 of NIDGE.

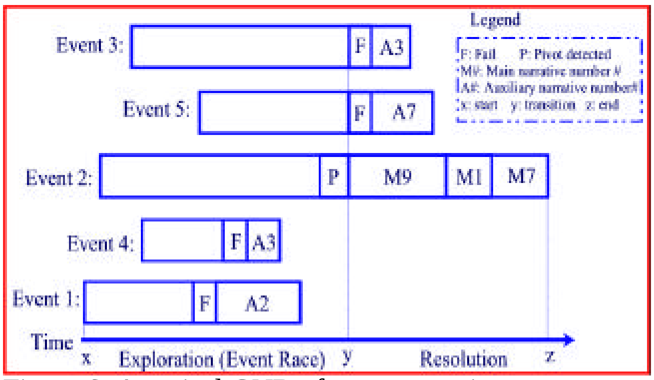


Figure 6: A typical GNB of a game session.

Explanation of figure 6:

- *Event (a whole block)* is a narrative thread that can potentially become the game narrative. An event is created when the DM detects (M) during the Exploration—(M) is the C1, and detecting (M) is the M1 of NIDGE. Furthermore, all events are closed (some are closed in the resolution phase after the Pivot is detected).
- *Event Race (race)* is a race among events held during the Exploration. The goal of the race is to find one of the available Pivots. The winning event (only one) contains the one main intention of the game narrative.
- *Exploration* is a phase where the game searches for a Pivot. It is non-scripted (not depending on any existing narrative—sub-blocks with no label).
- *Resolution* is a phase to resolve the main intention in the Pivot. It is scripted (based on the existing narratives—sub-blocks with labels).
- *Pivot detected* indicates that the main intention of the narrative has been decided.
- *Fail* is when the event can no longer find a Pivot.
- *Auxiliary narrative* is a simple existing narrative used to close an event that has failed.
- *Main narrative* is a complex existing narrative used to resolve the main intention.

Analysis Layer

The modules in the analysis layer are at the heart of NIDGE. They give NIDGE the ability to provide narrative interactivity. Basically, they shape the game narrative to be like the one as shown in figure 6.

Below is the quick overview of these modules. Implementation details of the modules can be found in [Kurniawan, 2001].

Before Pivot Interactivity Mechanism (BPIM) acts as the race organizer (see figure 6 of the Presentation Layer)—BPIM is the M2 and M3 of NIDGE. BPIM's responsibilities include:

1. *Referee:* Using narrative data from the DM (interactive mechanism), ASL-PU transformer, BPIM informs the DM the race's winning-event (winner). The winner would be the event that first finds a Pivot.
2. *Time Regulator:* There is a possibility that the race takes too long to have a winner.

BPIM regulates the race by making the Pivots easier or harder to find.
3. *Executor:* Events that lose the race are closed with existing narratives stored in AIT (see data layer).

After Pivot Interactivity Mechanism (APIM)'s task is to close the main intention of the winning event (resolution phase).

- Using Rule 1 (see issue #3), APIM searches MIT (see data layer) for existing narratives with the same Pivot as the winning event's Pivot.
- Using Rule 2 (see issue #3) and the narrative data from DM (interactive mechanism), APIM "tailors" the returned existing narratives together to build the resolution phase of the game narrative.

Together with BPIM, APIM also forms the M2 and M3 of NIDGE.

ASL-PU Translator (translator) is a tool to translate an ASL graph to its corresponding PU graph and vice versa.

Narrative Loader is a tool to load the existing main and auxiliary narratives to the MIT and AIT respectively. Because MIT and AIT store narratives in their PU graph representations, it is necessary to translate any ASL graph of a narrative to a PU graph before the narrative gets loaded.

Data Layer

The modules in the database layer are primarily used to store and provide access to the existing narratives repository, the C2 of NIDGE. The implementation details of the database layer can be found in [Kurniawan, 2001].

Data Manager manages the data access from the analysis layer's modules.

Main Index Table (MIT) is a two-column table. The first column stores the Pivots of the main narratives, and the second column stores the corresponding main narratives.

Auxiliary Index Table (AIT) is similar to MIT but for storing auxiliary narratives.

4. EXPECTED QUALITIES OF OUR GAME

Although we have not implemented NIDGE, we expect the game that uses NIDGE to have a certain set of qualities. The qualities that we are interested in are the level of narrative interactivity and the dramatic level of the game narrative.

As shown in figure 6, our game narrative (our game) can be divided into two phases. BPIM is responsible for the Exploration, and APIM is responsible for the Resolution. In figure 7, we can see that both phases are narratively interactive and dramatic. However, Exploration is more interactive than Resolution, while Resolution is more dramatic than Exploration.

Exploration achieves narrative interactivity by letting the player to explore many events to find a Pivot. Resolution achieves narrative interactivity by letting the player to choose among several existing narratives to resolve the winning event from the Exploration phase. In figure 7, there is not any moment during Exploration where the narrative interactivity drops to zero because virtually, there could be many events that can offer the player with narrative interactivity at any time. During Resolution, the narrative interactivity often drops to zero because there is only one active event (the winner).

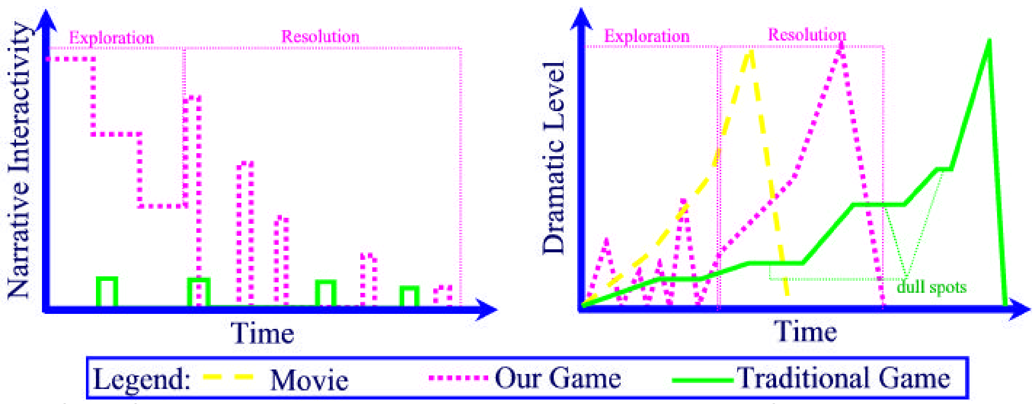


Figure 7: Profiles of typical Movie, Traditional, and Our games narratives from narrative interactivity and dramatic level perspectives.

Moreover, in figure 7, both phases show decreasing trend of narrative interactivity over time. For Exploration, BPIM regulates the exploration time by making the Pivots easier to find (which leads to less narrative interactivity). For the Resolution phase, because the level of narrative interactivity is proportional to the number of existing narratives that share common set of plot units with the game narrative, the level of narrative interactivity becomes less over time.

Compared to other narratives, our game narrative should offer substantial improvement in terms of narrative interactivity (notice that a movie does not offer any narrative interactivity).

In terms of the dramatic level, all three narratives can achieve high degree of drama. However, the traditional game narrative is usually too long to finish and has many dull spots[9], while movie narrative is concise but not interactive at all. Our game narrative should cut down the dull spots and shorten the narrative time, and arguably better than the others.

Finally, more existing narratives stored in MIT and AIT should lead to higher level of narrative interactivity. This means that the narrative interactivity of our game is more scalable than the traditional game's. This scalability improvement is depicted in figure 7 by the apparent difference between the narrative interactivity level of our game and the traditional game.

5. DISCUSSION

We have shown how NIDGE can potentially provide a game with dramatic and interactive narrative. And from figure 7, our game should be better than the alternatives. However, we have to re-stress that our game narrative is still at the theme-level (not presentable yet). Further research needs to be done to convert the themes into plots.

Moreover, even at the theme-level, NIDGE has yet to be implemented. Implementing NIDGE is important because we are aware that many experiments need to be conducted to fine tune NIDGE. Among the many questions we have, we need to know: How many existing narratives need to be loaded to make an interesting game? What kind of universe data needs to be monitored by Drama Manager? How often should the Drama Manager interact with the BPIM or APIM?

[9] Dull spots are common in traditional adventure games (e.g., Roberta William's *King Quest* series) where puzzles are involved. When a puzzle is too hard for the player, the traditional game usually offers little guidance on how to solve it. After trying to solve the puzzle for a long period of time, the player could become frustrated and lose interest in the game.

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